REMARKS

An Office Action was mailed on September 20, 2005. Claims 1-14 are pending, of which claim 1 and 14 are independent claims.

By the foregoing, claims 1, 2, 4-7, 9-12, and 14 are amended; claim 3 is cancelled; new claims 15-20 are provided. No new matter has been added.

Claims 1-14 stand rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over JP 09-209134 (JP '134) or JP 07-054132 (JP '132). Reconsideration of the rejections in view of the above amendments and the following remarks is requested.

The oxide sintered body of the presently claimed invention comprises titanium as an essential element. The titanium is contained in the idium oxide as an additive. The cited art of JP '134 and JP '132 do not teach, disclose, or suggest that claimed invention. The cited art discloses titanium as an optional element, not an essential element, as presently claimed. JP '134 discloses in "Problems to be solved" page 3, and JP '132 in "Constitution" page 3, a body that may contain titanium. More specifically, it is disclosed that "at least 1 type of metallic element chosen from the group . . ." (Problems to be solved, page 3, JP '134) and "one or more type of elements of zinc, . . .titanium" (Constitution, page 3, JP '132). Thus, neither JP '134 nor JP '132 disclose titanium as an essential element of the sintered body, compact or target.

In contrast, in the present invention, titanium is an essential element of oxide sintered body such that the film formed from the compact have characteristic effects as described in the Specification, which in part reads:

> *"According to tests by the inventors, it was made clear that when titanium was added to indium oxide film as impurity ions, it was possible to increase the mobility of the carrier electrons without greatly increasing the number of carrier electrons, and thus it is possible to form a transparent conductive film having low resistance and high infrared transmittance. The oxide sintered body of the present invention is used for raw material in production of the transparent conductive film having such characteristics. This is the main reason for including the element titanium in the sintered body of the indium oxide"* (page 12, lines 9-18 of the Specification);

> *"The main component of the titanium-added indium-oxide type sintered body of this invention is indium oxide, and it contains titanium such that the atomic ratio of the titanium....."* (page 9, line 1-3).

Moreover, JP '132 relates to ITO in which In and Sn are essential metal elements, and it only discloses adding Ti as an optional element to ITO. Meanwhile, in the present invention, as described in claim 4, the oxide sintered body contains only a minimum quantity of Sn. It is described that "in order to stably manufacture the transparent conductive film that has low resistance and high transmittance of infrared rays, it is desirable that the element tin contained as an impurity in the oxide sintered body is restricted in amount such that the atomic ratio Sn/In is 0.0025 or less, and it is further desirable that substantially no tin is contained in the oxide sintered body" on line 10 to 15, page 13 of the present specification. Therefore, this invention is different from the technique described in the citation.

Applicant respectfully submits that one skilled in the art would not look to the teachings of the cited art and recognize that titanium is an essential element, when the teachings are directed to an optional element. Thus, one skilled in the art would fail to recognize the inherent advantages and effects of the presently claimed sintered oxide body. Accordingly, the Examiner is respectfully requested to withdraw the rejection for this reason alone.

The rejection purports that JP '134 discloses in Table 2 that a sputtering target includes Titanium within the claimed atomic ratios and that JP '132 discloses in Table 3 and the Abstract the sintered compact/sputtering formed by incorporating titanium. Applicant respectfully traverses.

JP '134 teaches that the atomic ratio is defined only by a formula of

(all metal atoms)/(In + all metal atoms).

Please see claim 1 and paragraph 15 et al.

JP '134 teaches that "if this atomic ratio dislocates from the above mentioned range [i.e. 2.0 to 40 at %], the specific resistance of the transparent electrically conductive film . . . will [be less than] 9.6×10^{-4} Ω • cm . . . or . . . it is because the it becomes difficult to make the volume resistivity . . . [less than] 5×10^{-2} Ω • (Ohm).cm or less." Paragraph 16.

Thus, applicant respectfully submits, that by merely comparing the atomic ratio of the disclosure of JP-134 does not teach, disclose, or suggest the presently claimed invention. For example Table 2, paragraph 70, of JP '134, titanium is selected and added as one of the metallic elements, and the ratio of TI/In for only example 11 falls within the atomic ratio of the oxide sintered body of the presently invention, namely 0.003-0.120 claim 1) out of examples 1, 11, 12-16 in Table 2 of JP-134. This, however, fails to teach the specific resistance.

In fact, JP '134 discloses the abnormal discharge resulting from the high volume resistivity of the target, film forming speed, stable film forming, in its general context of film forming processes. See for example paragraphs 7, 8, and 10. JP '134 does not teach, disclose, or suggest lowering the occurrence of arching by control of the TiO_2 phase (P.15, line 4-13), improving speed of formation of the film (P.14, line 15-17), or higher transmittance of infrared ray area (P.13, line 9-10).

Similarly, JP '132 does not disclose the atomic ration of Ti/In, the relationship between preferred existence phase of TiO_2 in the sintered oxide body and the specific resistance (page 17, line 3-16), the relationship between specific resistance and film forming speed (page 14, line 18 to page 15, line 3, Table 1), nor the relationship between relative density/surface roughness and film forming speed (page 20, line 18 to page 21, line 2, page 22, lines 10-14).

One skilled in the art may read the disclosure of paragraphs 21, 22, 30 et al. of JP '134 and paragraphs 5-7 et al. of JP '132 to understand that the density of the target is to be controlled so that it falls within a certain limited range. This may result in the desired characteristics of suppressing the occurrence of nodules on the surface of the target and improving a sputtering rate through low resistance of the target is achieved. However, the specifically claimed ranges are neither disclosed nor they merely a variation of the teachings of JP '134 and/or JP '132 thereof.

Crystalline structure of the oxide sintered body in respect to titanium depends largely on conditions at the time of manufacturing oxide sintered body. As may be understood by comparing the case of examples 1-8 (page 23 et al.) and later examples 9-40 (page 28 et al.), of the present invention, TiO_2 phases contained in the oxide sintered body greatly differ from each other, depending on diameter of particles of the raw powder materials, mixing conditions of the raw powder materials.

In the case of example 1-8, the In_2O_3 powder and TiO_2 powder having average particle size of 1 μm or less are used. The particles are blended and mixed using a wet-type bowl mill for 18 hours, and then a compact formed from the granulate is sintered. The result is that no titanium-oxide phase exists in the sintered body (page 23, lines 8-15; page 24, lines 9-12). In contrast, the case of comparative example 9-40, TiO_2 powder has a larger average particle size of 3 μm to 5 μm and mixing time is shortened to 5 hours. As a result, the oxide sintered body contains a TiO_2 phase (page 28, lines 14-18, 22).

As a comparison of sputtering film-forming test between example 1-8 and comparative example 9-40 shows, the former are superior in film-forming speed (Table 1, page 28; Table 2, page 29). Thus, these are more useful and more readily accepted in industrial production.

Thus, the above described oxide sintered body of the present invention, as claimed for example in claim 5, is not /taught, disclosed or suggested by the cited art, because, as applicant respectfully submits, it not a mere chance alteration of Ti amount or ratio in the oxide sintered body that produced the effects of the present invention.

In the present invention, the amount of Ti contained in the oxide sintered body is controlled by restricting an atomic ratio Ti/In(Sn) within the specified range, and it achieves low-resistance film (page 12, line 9-P.13, line 10 etc.), and when forming a film by using an oxide sintered body containing Ti, no arching occurs by the controlling titanium oxide crystal phase in oxide sintered body (page 15, line 4-13). None of these are disclosed in nor suggested by either of JP '134 and JP '132. Accordingly, the Examiner is respectfully requested to withdraw the rejection for the reasons given above.

Furthermore, Applicant respectfully submits that one skilled in the art would not look to JP '134 for teaching of the present inventions since their objects are directed to different aim. An object of JP '134 is to provide a sputtering target, which can stably produce a transparent electrically conductive film with resistance of 800 Ω/ cm ~ 10k Ω/cm, and its manufacturing method. Paragraph 9. The intended use of the film is for an analog-type touch panel. Paragraph 4-6.

Therein, JP '134 teaches that for a transparent-electrode film for an analog-type touch panel, a new high electrical resistance film replacing an ITO film is desired. Paragraph 5. This accomplished by using the oxide sintered compact of specific composition and specific electrical property, which can be used to make a transparent electrically conductive film which has the above sheet resistivity.

In contrast, the present invention is to provide high light transmittance and low resistance target to achieve the object, as described in the Specification, that is:

> *"...an object of this invention is to provide a titanium-added indium-oxide sintered body target that has high transmittance in not only the visible light range but also the infrared light range, and that is used for manufacturing an oxide transparent electrode film having low resistance, and that is formed by direct-current sputtering using a power supply that has no arching-control function, and for which it is difficult for arcing to occur even when high voltage is applied, and that can be formed at high speed without*

arcing occurring even when power is applied for a long period of time" (Summary of Invention , page 8).

Therefore, the objects of inventions between JP '134 and the present invention are entirely different, which is characteristically shown, for example, in the difference of volume resistance of target, namely "5 x 10^{-2} Ω • cm or less" in JP-134 (claim 1), whereas specific resistivity is "1 x 10^{-3} Ω • cm or less (claim 11), or "5.5 x 10^{-4} Ω • cm or less" (claim 12) in the present invention. Accordingly, the Examiner is respectfully requested to withdraw the rejection for this reason alone.

Specifically with regard to JP '132, the reference discloses that by adding one of more elements selectable from a large group, including titanium, to the oxide sintered body, a high density target is obtained, which, in effect, produces a very low resistant and highly transparent electrically conductive film, with a fast film forming rate, without nodules on the target surface, crack of target, or scattering of the damaged particles from the target. Please "Advantage of the Invention," paragraph 26; paragraph 9. However, in JP '132, titanium similarly is not an essential element of the sintered oxide body, but remains one of the elements selectable from a large group. "Constitution" P.3, claim 1 etc. JP '132 fails to teach, disclose, or suggest the claimed invention or to appreciate the advantages obtained by adding titanium in a sintered oxide body. Page 12, lines 10-18; page 13, line 9; page 15, line 4-13.

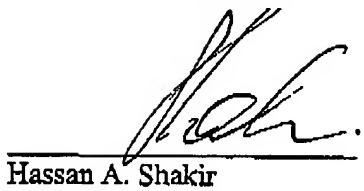
For the individual reasons detailed above and for the cumulative of the above reasons, which Applicant respectfully submits would not lead one skilled in the art to arrive at the presently claimed invention.

All dependent claims are allowable for at least the same reasons as the independent claim from which they depend.

The application is in condition for allowance, which action is respectfully requested. However, if for any reason the Examiner should consider this application not to be in condition for allowance, the Examiner is respectfully requested to telephone the undersigned attorney at the number listed below prior to issuing a further Action.

Any fee due with this paper, including any extension fees, may be charged on Deposit Account 50-1290.

Respectfully submitted,



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